DOCUMENT RESUME

ED 216 633 HE 015 086

AUTHOR Finkelstein, Martin
TITLE Faculty Colleagueship Patterns and Research Productivity.
PUB DATE Mar 82
NOTE 42p.; Paper presented at the Annual Meeting of the American Educational Research Association (New York, NY, March 1982).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *College Faculty; Higher Education; Interaction Process Analysis; Interpersonal Relationship; Interprofessional Relationship; *Need Gratification; *Peer Relationship; Private Colleges; *Productivity; *Publications; Research; *Scholarship
IDENTIFIERS *Collegiality; Faculty Publishing

ABSTRACT

The effect on productivity on different types of collegial interaction among faculty were studied with attention to institutional type, disciplinary affiliation, orientation to teaching versus research, and career age. Collegial interaction was defined in terms of the reciprocal fulfillment of needs or exchange of services that occur in the course of faculty interactions. A questionnaire asked respondents to indicate whether each of 30 functions colleagues may perform was currently being fulfilled for them by: their department colleagues, their extra-departmental campus colleagues, and their off-campus disciplinary colleagues. The questionnaire also solicited data on various professional characteristics, including their publications. Usable responses were obtained from 95 faculty of a private research university and 81 faculty of 2 private liberal arts colleges in the Rocky Mountain region. The original 30 functions performed by colleagues were reduced to 4 factors/need categories by 2 rounds of factor analysis, and 4 distinguishable colleagueship patterns were identified. The patterns of collegial interaction were examined in detail with respect to professional orientation, age, and type of school. A main finding was that the overall pattern and structure of collegial need fulfillment is importantly associated with research productivity. The particular pattern that marked the productive faculty member combined strong off-campus collegial functioning with strong departmental functioning and relative insulation from extra-departmental campus colleagues. (SW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED216633

FACULTY COLLEAGUESHIP PATTERNS AND RESEARCH PRODUCTIVITY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Martin Finkelstein

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Martin Finkelstein
University of Denver

Paper presented at the Annual Meeting
American Educational Research Association
New York, March 1982

HE 015 086

INTRODUCTION

The last decade has witnessed a geometric increase in the study of faculty productivity--especially productivity in research as measured by publication rate (Finkelstein, 1978). For the most part, investigators have sought to locate the determinants of research productivity, on the one hand, at the macro level in the organizational characteristics of a professor's current institutional affiliation or doctoral institution and in his/her disciplinary affiliation, and, on the other, at the individual level, in terms of various professional and personal characteristics of the individual faculty member, e.g. their relative orientation to teaching versus research, academic rank, sex, career age, etc.

In at least one sense, this effort has been highly successful: Investigators have managed to account for a very high proportion of the variation in publication rate (as much as two-thirds--v. Blackburn et al, 1978). In another very important sense, however--in the sense of providing grounded (tested) explanations of the dynamics through which these macro level factors and individual characteristics actually lead to publication activity--they have been somewhat less successful. Thus, for example, having determined that institutional type and prestige or disciplinary affiliation, on the one hand, and individual faculty characteristics, on the other, are important determinants of publication rate, the modal approach has been to assume that these relationships reflect the operation of differential "colleague climates" (Lazarsfeld and Theilens, 1958; Blau, 1973; Long, 1978) or differential patterns of work activity at different types of institutions, among practitioners of different disciplines, and among faculty with different professional orientations (Mannis, 1950; Thorp, 1970; Fulton and

Trow, 1974)--albeit systematically examining these latent processes/dynamics and explicitly linking them to both macro factors and individual characteristics. This paper explicitly addresses itself to examining one such latent process that is widely assumed to mediate the relationship of macro factors and individual characteristics to research productivity: Collegial interaction among faculty. It is assumed that an understanding of this intermediate or interactive level of analysis is a key to our understanding of the dynamics of research productivity.

Having sounded the call, as it were, I must hasten to add that I am hardly the first to recognize this gap and seek to bridge it. In the early 1970s, Biglan (1971) noted the differential degree of social connectiveness among faculty in different disciplines; Crane (1972) examined the operation of "invisible colleges" of faculty working in particular areas of research; Lodahl and Gordon (1972) examined differential patterns of faculty-graduate student interaction in the research process in disciplines characterized by differing levels of "paradigm development" in the Kuhnian sense (Kuhn, 19); and Smart (197) has examined the differential work orientations and personality patterns that characterize faculty in different disciplines, using Holland's theory of personality types.

While all of these studies provide insights that are directly applicable to an understanding of faculty research productivity, they do not explicitly consider the productivity connection. A number of more recent efforts, however, do. Both Reskin (1977, 1979) and Long (1978) examined the nature of the sponsorship relationship (i.e. the relationship between graduate students and their faculty sponsors) as it mediated the relationship of prestige of doctoral institution to later career publication productivity. Cameron and Blackburn (1981) focused as well on the sponsorship/mentoring relationship

as it mediated the association between current institutional affiliation and publication activity. And finally Blackburn et al (1978) examined "communication with disciplinary colleagues" as a determinant of publication rate.

While all these studies provide varying degrees of support for the role of social/professional interaction variables in productivity, they do so for rather specialized interaction: Between graduate students and their mentors, and between faculty and off-campus disciplinary colleagues. The present study seeks to extend this work by focusing more broadly on the many varities of collegial interaction as they mediate the effect of macro and individual characteristics on research productivity. specifically, we will be examining the mediating effects of colleagueship with two macro variables--institutional type (four-year undergraduate liberal arts college versus Ph.D. granting university) and disciplinary affiliation--and two individual faculty characteristics--relative faculty orientation to teaching versus research and career age (years of experience in the professoriate). Institutional type and disciplinary affiliation were selected since they are both the most studied and powerful macro level determinants of research productivity (Fulton and Trow, 1974; Blau, 1973; Blackburn et al, 1978). Teaching/research orientation was selected as one of the individual faculty characteristics for precisely the same reasons (Fulton and Trow, 1974; Blackburn et al, 1978. Finally, career age was selected for two reasons: Although not among the most studied determinants, Bayer and Dutton (1976) have convincingly demonstrated that publication rate varied systematically, if nonlinearly, over the course of an academic career; moreover, the recent work of Baldwin (1980) suggests that faculty role orientations, work activity patterns, and presumably collegial interactions, vary systematically over

the course of an academic career.

CONCEPTUALIZING COLLEAGUESHIP AS A MEDIATING VARIABLE

For purposes of this study, collegial interaction was defined in a functional way in terms of the reciprocal fulfillment of needs or exchange of services that takes place in the course of faculty-faculty interaction. Most generally, this approach to the definition of collegial interaction derives from various psychological theories of human need hierarchies (v. Maslow, 1970; Alderfer, 1972). The choice of a "need fulfillment" model seemed appropriate in view of the demonstrable role of need fulfillment in accounting for the initial choice of an academic career (Freedman et al, 1979) and in accounting for the intrinsic motivation that appears to guide faculty in their work performance (Bess, 197 ; Finkelstein, 1978). It seemed appropriate to assume that colleagues functioned in an important way to meet each other's needs for belonging, esteem and self-actualization (Maslow) and for relatedness, including respect and recognition, and professional growth (Alderfer).

More particularly, the choice of a functional "need fulfillment" conceptualization derived from the theoretical work of the sociologist Mark Granovetter (1977) on interpersonal networks. Granovetter began by identifying four dimensions along which to characterize the "strengths" of interpersonal ties: (1) the temporal preemptiveness of a tie (i.e. how much time is devoted to it); (2) the intimacy (mutual confiding) of a tie; (3) the emotional intensity of a tie; (4) the extent of reciprocal services exchanged within the context of the tie (i.e. need fulfillment). Granovetter went on to advance, and other investigators to support (v. Milgram, 1967; the proposition that the power

of such interpersonal ties in terms of their efficiency in transmitting new information (clearly a critical function of faculty-faculty interaction) was an inverse function of their temporal preemptiveness and intimacy/intensity and a positive function of the overall extent of services exchanged. Put another way, the largest amount of information was received by those individuals with a large number of weak ties (ties based exclusively on the exchange of services, unencumbered by temporal and emotional constraints of intimacy) while less new information would be received by those who "exchange services" with a smaller, more intimate network. These hypotheses and findings directly influenced our conceptualization of colleagueship as the a variable. They suggested a focus on overall level of need fulfillment (exchange of services) across a faculty member's collegial network rather than on a faculty member's ties to particular individual colleagues. Hence, we sought to inquire about needs/functions fulfilled or unfulfilled rather than about individual ties. Moreover, insofar as we sought to relate an individual's collegial interaction to their own productivity, it seemed appropriate to focus asymmetrically on the focal individual's receipt of services or need fulfillment rather than on the social exchange or reciprocal aspects of need fulfillment.

Beyond the overall level of need fulfillment, two other aspects of collegial interaction seemed important. First, substantive content of the needs or functions being fulfilled. It was assumed that faculty needs might vary in their salience, the fulfillment of some being more critical than the fulfillment of others for research productivity. It seemed necessary, then, to examine level of fulfillment for particular needs/functions as well as the overall level of fulfillment across need categories. Second, there was some evidence to suggest that the location of, or social distance

between, an individual and their colleagues might effect the fulfillment-productivity relationship. For example, Blackburn et al (1978) reported that communication with off-campus colleagues in one's field of specialization bore a positive relationship to research productivity, while Glueck and Jauch (1975) found that professors rarely reported their departmental colleagues as sources of productive research ideas. This potential substantive need by colleague location interaction seemed to require that we examine the fulfillment of particular needs in the context of colleague location (colleagues in the focal individual's department, off-campus disciplinary colleagues as well as on-campus colleagues outside one's own department).

The final aspect of collegial interaction to be examined was the overall pattern or structure of need fulfillment, i.e. what "individual differences" do faculty show in the pattern of which needs are being fulfilled by whom to what extent?

The three aspects of colleagueship to be examined in relationship to productivity parallel the three sources of variation highlighted in the classic analysis of variance model (Gollob, 1968): Variation due to average individual effects (i.e. overall level of need fulfillment), average variable effects (i.e. levels of fulfillment of particular needs, as these may or may not interact with colleague location), and interaction effects (the pattern of individual differences, or particular need overall level interaction). This conceptualization permits us to precisely allocate variation in productivity to the three sources of variation in collegial interaction.

RESEARCH PROCEDURES

Data Collection and Sampling. The first step in operationalizing the colleagueship variables was to determine the "needs" or "functions" faculty colleagues fulfilled for each other. While the need hierarchy models of Maslow and Alderfer provided a general framework within which to conceptualize categories of need, there remained the task of identifying the specific needs colleagues fulfilled for each other in an academic setting. Interviews were held with a dozen randomly selected faculty (stratified by tenure status, discipline, and sex) in the Denver Metropolitan area. Interviewees were asked to identify up to a dozen professional colleagues in and outside their institution and were questioned at length about the nature of these relationships as they contributed to the satisfaction of professional growth, recognition and relatedness needs. On the basis of these interviews, a list of thirty functions colleagues performed for each other was generated (v. Appendix I) and formed the basis for a paper and pencil questionnaire. The questionnaire asked respondents to indicate whether or not each of the thirty functions was currently being fulfilled for them by first their department colleagues, second by their extra departmental campus colleagues, and third by their off-campus disciplinary colleagues--a total of ninety individual ratings (thirty functions by three colleague groups). In addition, the questionnaire solicited data on various professional characteristics, including disciplinary affiliation, publications in the past two years (books, monographs, articles as well as research reports), years of full time experience as a faculty member (career age), and relative orientation to the teaching versus research role (very heavily oriented to research; both, but leaning to research; both, but leaning to teaching; and

very heavily oriented to teaching).

The questionnaire was mailed to a stratified (by department) random sample of 210 full-time faculty at a private research university (Carnegie Ph.D.-granting I) and 230 full-time faculty at two private liberal arts colleges (Carnegie Liberal Arts I and Carnegie Liberal Arts II) in the Rocky Mountain region. A month later, a follow-up letter together with a second copy of the questionnaire was mailed to non-respondents.

One hundred and seven members of the university faculty sampled returned the questionnaire for a response rate of 50.2 percent. Of these 107 responses, ninety-five were usable for the analysis, thus yielding an effective usable return rate of 44.6 percent. A comparison of the distribution of respondents and non-respondents by rank and discipline revealed no obvious respondent bias to be operating.

Eighty-one members of the liberal arts college faculty sample returned the questionnaire for a much lower overall response rate of 35.2 percent (the response rate was about the same for both of the liberal arts colleges). Seventy-one of these responses proved usable in the analysis, for an effective usable response rate of 31 percent. A comparison of the distribution of the total liberal arts college sample with the distribution of respondents by discipline and rank showed slight underrepresentation of humanities faculty (-7.6 percent) and junior faculty in the instructor/lecturer ranks (-6.0 percent) and a slight overrepresentation of national scientists (+5.0 percent) and associate professors (+5.4 percent). While these disparities are not by themselves large enough to suggest a dangerous respondent bias, they, together with the low overall response rate, suggest that some caution need be exercised in generalizing from the findings.

Data Analysis

1. Operationalizing the Dependent Variable. Following Crane (1969), publication rate over the past two years was operationalized via construction of a weighted index: Three times the number of books + number of monographs + number of journal articles + number of research reports.

2. Operationalizing the Colleagueship Variables. Ratings on the thirty functions for each colleague group were separately factored, using a principal factoring approach without iteration (in effect, a principal components approach, albeit substituting communality estimates in the diagonal of the correlation matrix) and a varimax rotated solution. On the basis of the rotated principal factor solution, a series of scales were constructed to represent the major categories of needs fulfilled in turn by department, campus and off-campus colleagues. Since common categories of needs emerged across factor analyses of the three colleague groups, leading to some rather high intercorrelation among the scales, a second order principal components analysis was undertaken to yield a small number of orthoginal need fulfillment categories across colleague groups. On the basis of this second order factoring, the original scales were combined to form a small number of second order scales whose scores were operationally defined to represent the levels of fulfillment on the major substantive/content categories of need. These second order scales scores were simply average to compute each individual's overall level of need fulfillment (the variable we have labeled COLLEVEL).

In order to determine the major patterns of collegial need fulfillment that sampled faculty displayed, the second order scales scores were used to form a profile for each respondent and these profiles were subjected to a

linear typal analysis. As described by Overall and Klett (1972):

> Linear typal analysis is a method of studying relationships of observed individuals to underlying pure types. From a mechanical point of view, it is much like factor analysis or linear components analysis, except for minor scaling differences. From a theoretical point of view, one starts by assuming that underlying any hetrogeneous group of individuals are a relatively few basic pure types. Any one individual can be a mixture of several types, although he is likely to resemble most closely one particular pure type...Linear typal analysis aims at discovering the nature and number of underlying pure types, defining a prototype score vector to represent each pure type, and then determining the similarity of each individual to each of the hypothetical pure types. If most individuals can be recognized as being highly similar to one and only one of the underlying pure types, a classification grouping can be accomplished by assigning each individual to the class represented by the pure type having a profile most similar to his own...The model for linear typal analysis is thus a simple linear model in which the observed profile for any individual is conceived as a weighted average of pure type profiles, plus an error component...Disregarding the random error component, the observed score profiles are approximated as linear combinations of the pure types. Since the observed profile vectors can be represented, apart from an error component, as the weighted average of pure type profiles, the reciprocal relationship requires that it be possible for pure type profiles to be estimated as simple weighted averages of the individual profile vectors...The problem in linear typal analysis is to determine how many pure type profiles are required to account for the observed score vectors and to determine the appropriate values for weighting coefficients used to define the prototype profiles as linear combinations of the observed score vectors...

In this study, linear typal analysis was applied to the 164 respondent profiles as follows:

1. A matrix of 164 rows (subjects) by "n" columns (second order scale scores) was constructed;
2. The profiles were initially standardized, i.e. each variable (column) within all profiles was corrected to zero mean across all individuals (rows);
3. The mean of each profile (row) was then substracted from each row score;
4. This yielded a double centered matrix--i.e. one from which the average effects of individuals (overall level of need fulfillment) and

of variables (level of fulfillment of particular needs) were partialed out, leaving only that variation due to individual by variable interaction--to which a constant elevation correction was added (v. Gollob, 1968);

5. The double centered and elevation corrected data matrix was transposed, yielding an "n" row by 164 column matrix (in effect, making individual respondents the variables);
6. On the basis of this transposed data matrix, a matrix of profile similarity coefficients--the average cross product of profile elements--was computed;
7. The matrix of similarity coefficients was subjected to a principal factor analysis with iteration, followed by a varimax rotated solution. These varimax rotated factors operationally represented the pure type patterns underlying the set of profile and their loadings, the degree to which each respondent resembled each pure type;
8. On the basis of their loadings on each pure type, respondents were assigned to that pure type on which they clearly loaded most highly. Approximately 80 percent of the respondents (N = 136) were clearly classifiable as loading high principally on only of the pure types, and their classification code was added as a nominal variable (COLLTYPE) to the data file for further analysis. The remaining cases that were not clearly classifiable as one or another pure type were coded as missing on this COLLTYPE variable;
9. Prototype profiles representing the pure types were constructed by simply averaging the profiles of those respondents that loaded most highly on each pure type.

Examining Variation in Colleagueship Across the Macro Variable and Individual Characteristics. Having derived measures of the three sources of variation in collegial interaction, these were examined in relation to the two macro variables and the two individual professional characteristics to discern any distinctive patterns of collegial interaction by institutional type, discipline, faculty orientation to teaching versus research, and career age. Owing to the relatively small sample size, all nonnominal variables (with the exception of teaching-research orientation) were dichotomized into high and low categories at the median (footnote: In the case of teaching-research orientation, the categories are very heavily into and leaning toward research were combined into a single research oriented category, as were the two teaching oriented categories). The relationship of the colleagueship variables to the macro and individual characteristic variables was tested via chi square analysis. Wilkes' lambda was computed as a measure of the strength of association (footnote: Lambda was selected as the measure of strength of association rather than the contingency coefficient in order to facilitate comparative assessments of the relationship strengths across contingency tables that varied in their row and column dimensions).

Testing the Mediating Influence of Collegial Interaction on Publication Rate. The mediating influence of collegial interaction on publication rate was tested via an analysis of covariance design. A series of ANCOVAs (analysis of covariance) were run with publication rate (low versus high) serving as the dependent variable, and each dichotomized measure of collegial interaction successively serving as the nonmetric/nominal independent variable or factor, and finally with the macro variable and the individual faculty characteristics

serving as the metric covariates.* The ANCOVA program employed was designed to test the independent effect of the independent variable adjusting for all the covariates. It was not, however, designed to test for interactions among the covarities or between the independent variable and the covariates. (Footnote: No test for interaction among the colleagueship variables was necessary, since the COLLTYPE variables as conceptualized effectively represented the interaction term). In order to ensure that no such hidden covariate and factor-covariate interactions were operating to effect the interpretation of the ANCOVA results, a series of initial analyses of variance were run to test for such potential interaction effects.

Since ANCOVA tables provide only the statistics necessary for testing the overall significance of an independent variable, and do not allow examination of the pattern of relationship of various categories of the independent variables to the dependent variable, MCA (multiple classification analysis) tables were generated for each ANCOVA run. MCA tables graphically display the deviation from the grand mean of each category of the independent variable as it is successively adjusted for the other independent variables and the covariates, as well as providing measures of the strength of association (eta and beta coefficients) at each stage of adjustment. Since MCA tables neither take into account nor display interaction effects, their proper interpretation assumes the operation of no interaction effects. Insofar as such effects were found to be operative in the earlier ANCOVA run,

* Institutional type, as a dichotomy, was treated as an interval level metric variable. In the case of discipline, a set of dummy variables was created. Owing to program limitations on the number of covariates that might be entered into the analysis, only the dummy variable representing Social Science Faculty (the category of discipline that showed the strongest relationship to publication rate) was actually employed in the analysis. Both individual characteristics were dichotomized.

the MCA tables were supplemented by chi square analyses of the interacting variables.

RESULTS

Results of the Initial Factor Analyses. On the basis of the initial factor analyses of the thirty needs/functions for each colleague group, fourteen need categories or factors were identified accounting for approximately 70 percent of the variance in the items: Five need categories both for department and off-campus colleagues and four for campus colleagues. While varying slightly in their preemptiveness and in the precise item loadings, the five factors/need categories for department and off-campus colleagues corresponded nearly perfectly. They included:

1. Help in teaching (functions number 9, 11-13), including advice in developing new courses, using teaching techniques, resolving specific classroom problems, and on course reading and writing assignments;
2. Help in research (functions number 1, 2, 4, 10, 30)--including such functions as collaboration and copublication, providing a testing ground for research ideas and critical feedback on professional writing, as well as consulting on specific research related problems;
3. Institutional linkage (functions number 15, 20, 21, 25), including functioning as an informant on institutional policy, department/institutional "politics," and sponsorship for campus or department committee assignments;
4. Linkage to the discipline (functions number 3, 5, 7, 8, 18, 26, 27)--including such functions as help in identifying sources of research support, gaining access to publication media, sponsorship for academic positions and professional association offices, as well as facilitating "contacts" within the disciplinary elite;

5. General support, intellectual stimulation, and friendship (functions number 16, 19, 23, 28)--including such functions as general support and encouragement, career advice, intellectual stimulation, and generally providing a "listening ear".

The four need categories/factors emerging from the factor analysis for campus colleagues included all but the "linkage to the discipline" factor.

On the basis of these factoring results, fourteen scales bearing the same names as the factors were constructed. The reliability coefficients (Cronback's Alpha) of the scales ranged from a low of .71 to a high of .86, averaging .79. As expected, the intercorrelations among similar need category scales across colleague groups were often fairly high, thus requiring a second order factoring. The second order principal components analysis yielded four second order factors/need categories, accounting for just over two-thirds of the variance in the fourteen original scales. These included:

1. A general off-campus colleague factor, labeled OFF--loading high on four of the five original off-campus scales (excluding institutional linkage);
2. A general campus colleague factor, labeled CAMP--loading high on three of the four original campus colleague scales (except help in research);
3. Two department colleague factors, including
   a. department colleague help in teaching, research, and linkage to the discipline (labeled DEPT-TR);
   b. department colleague general support and institutional linkage labeled DEPT SUPPORT).

On the basis of these four second order factors, four second order scales

were constructed by simply averaging for each respondent scores on those first order scales loading highest on the four second order principal components.

Scores on these four second order scales were simply averaged to compute COLLEVEL--overall level of need fulfillment--and formed a four variable profile to which the linear typal analysis was applied.

Results of the linear typal analysis. The linear typal analysis yielded four pure types or colleagueship patterns. The prototypical profile for each pure type is displayed in Table 1, together with the overall sample mean and median on each profile variable. In addition, the table displays each type's COLLEVEL score--the average of each prototypical profile.

PLACE TABLE 1 HERE

The first two pure types are distinguished vis a vis types three and four by their very high level of department oriented need fulfillment. They diverge principally in the relative preemptiveness of campus versus off-campus colleagues. The first type, which we have labeled classic locals (borrowing liberally from Gouldner's original typology--v. Gouldner, 1957) tend to achieve high levels of need satisfaction from extra departmental campus colleagues, but to achieve very little need satisfaction from off-campus colleagues. The second type, which we have labeled Department Anchored Cosmopolitans, show precisely the opposite pattern--one of relative insulation within departmental boundaries on campus combined with relatively high off-campus need fulfillment.

The second pair of pure types, which for want of a better term we have

labeled The Unanchored Cosmopolitans, are distinguished by their very high levels of off-campus collegial functioning, moderate levels (below the overall sample mean and median) of extra departmental campus collegial functioning, and relatively low departmental colleague orientation. They diverge principally in the nature of the needs met by departmental colleagues: Type number 3 faculty's department relationships tend to be clearly task oriented (focusing on the teaching, research and disciplinary activities) rather than socioemotionally or institutionally oriented; while type 4 faculty tend to use their department colleagues for socioemotional support and institutional linkage but reserve the fulfillment of their disciplinary/professional needs to off-campus colleagues.

Results of the Contingency (Chi Square) Analysis. The results of the chi square analysis showed that neither overall level of need fulfillment (COLLEVEL) nor either of the department colleague need category scales varied systematically by institutional type, disciplinary affiliation, career age or relative teaching versus research orientation. Levels of off-campus and campus colleague need fulfillment (second order scales 1 and 2) as well as colleagueship pattern (COLLTYPE) did, however, vary considerably across the liberal arts college and university subgroups and across the research versus teaching oriented groups, but not across disciplinary or career age subgroups.

The results of these latter statistically significant associations are displayed in Tables 2-7 below.

PLACE TABLES 2-7 HERE

A glance at the tables reveals that the liberal arts college faculty were significantly more likely than the university faculty to look to extra departmental campus colleagues to fulfill the functions of colleagueship and significantly less likely to look to off-campus colleagues. It is not surprising that they were disproportionately represented among the first of our pure colleagueship types--the classic locals. University faculty showed quite the opposite pattern and were disproportionately represented among the second of our pure types--the department anchored cosmopolitans. It is interesting to note that those liberal arts college faculty who did not "fit the mold" (i.e. did not show a classic local orientation) tended to cluster in types 3 and 4, the unanchored cosmopolitans: In seeking need satisfaction through off-campus colleagues, they do not insulate themselves within their departments as was the modal pattern for the off-campus colleague oriented university faculty, but rather seemed to strike a balance between both a moderate campus and departmental colleague orientation.

A faculty member's relative teaching versus research orientation is also associated with differential patterns of colleagueship--albeit less powerfully so. Those faculty who are more oriented to research than teaching, not surprisingly, show higher levels of need fulfillment from off-campus sources and lower levels from extra departmental campus sources than those faculty who were more oriented to teaching. Research oriented faculty were disproportionately underrepresented among the classic locals--the modal category for teaching oriented faculty in the sample. If we examine the impact of teaching versus research orientation, controlling for institutional type, we find that this pattern holds for liberal arts college as well as university faculty.

Results of the Analyses of Covariance. The results of the analyses of covariance are displayed in Tables 8-19 below.

PLACE TABLES 8-19 HERE

A quick glance at the ANCOVA tables reveals that neither COLLEVEL (overall level of need fulfillment) nor level of departmental collegial functioning (Dept/Tr and Dept/Support) was significantly related to publication rate at the .05 alpha level, while COLLTYPE (overall of collegial relations), and to a lesser extent, levels of off-campus colleague and extra departmental campus colleague functioning were. The multiple classification analysis tables--in particular, eta (correlation ratio for each measure of colleagueship) and beta (the partial correlation ratio for each measure of colleagueship, adjusting for all the covariates)--immediately suggest two observations: (1) COLLTYPE has a stronger independent effect on publication rate than either off-campus or campus collegial functioning levels (beta = .24 versus beta = .10 and .08); and (2) COLLTYPE is less effected by adjusting for the covariates than either OFF or CAMP (COLLTYPE is reduced from an eta of .30 to a beta of .24, while the impact of OFF, for example, is fully cut in half, when adjusting for covariates).

If we isolate for a moment the COLLTYPE variable, we find that it alone accounts for about 6 percent of the variance in publication rate--a modest, but practically significant, effect size when compared with those reported for single variables in other studies (e.g. Blackburn et al, 1978). The MCA table suggests that the bulk of that effect is attributable to types 1 and 2 -- classic localism and department anchored cosmopolitanism.

The classic locals, the only one of the four colleagueship types markedly low in off-campus collegial functioning, show the highest negative deviation from the grand mean on publication rate (i.e. show the lowest publication rate); the department anchored cosmopolitans, on the other hand, show the highest positive deviation from the grand mean (i.e. show the highest publication rate). It is important to note that these departmentally anchored cosmopolitans while clearly well above the median in off-campus collegial functioning, are not as high in this category as either types number 3 or number 4. They differ from those unanchored cosmopolitans in two principal ways: (1) Their relative insulation on campus within their departments; and (2) Their strong departmental anchorage in combination with relatively strong off-campus relationships. It would appear, then, that the peculiar combination of these two characteristics of collegial functioning patterns seem to most effectively differentiate among the most and least productive faculty.

The peculiar potency of the colleagueship pattern reflected by the department anchored cosmopolitans is further supported by the remaining ANCOVA results for specific need categories and overall level of need fulfillment. While level of campus colleague need fulfillment is signficantly negatively related to publication rate and level of off-campus collegial functioning shows a positive relationship--the independent effect of each of these specific need categories alone is less than half as powerful as their combination (beta = .10 and .08 versus beta = .24 in combination). Moreover, if we examine both department factors alone, we find that while their impact approaches statistical significance, they are actually <u>negatively</u> associated with publication rate--suggesting that department anchorage, in the absence of a high level of off-campus collegial functioning, by itself

has no positive independent effect on publication rate. Finally, the results suggest that overall level of need fulfillment (COLLEVEL), independent of the peculiar pattern of that fulfillment, appears largely irrelevant to productivity: Indeed, among the two colleagueship types showing the highest overall level of need fulfillment--the classic locals and the department anchored cosmopolitans--we find at once both the lowest and highest productivity subgroups.

Two further observations are highlighted by these results. The first concerns hidden interaction effects that were uncovered in the preliminary analyses of variance described earlier. While no such interaction effects achieved significance at the .05 level, one did approach significance: Institutional type by colleagueship pattern. Tables 20-21 display the results of a chi square analysis of the association between colleagueship pattern and publication rate, controlling for institutional type.

PLACE TABLES 20-21 HERE

These tables suggest that colleagueship pattern (COLLTYPE) may be an even more powerful determinant of publication rate at four year undergraduate liberal arts colleges than at research universities. Department anchored cosmopolitanism, while relatively rare in the liberal arts setting, persists in its association with publication rate.

The second observation concerns covariate effects. Among the four covariates tested, a faculty member individual orientation to the components of the academic role (teaching versus research) emerges as by far the most significant determinant of publication rate among those tested. While individual role orientation is clearly associated with differential patterns

of collegial functioning, it has its own independent effect--albeit one that is smaller vis a vis overall colleagueship pattern (COLLTYPE) than vis a vis the level of fulfillment of particular collegial needs (OFF & CAMP).

DISCUSSION

These results suggest that above all else, it is not the overall level of collegial functioning, nor even the level of fulfillment of particular types of collegial functions, but rather the overall pattern and structure of collegial need fulfillment that is importantly associated with faculty research productivity. The particular pure type pattern that typically marks the productive faculty member—department anchored cosmopolitanism--combines relatively strong off-campus collegial functioning with strong departmental collegial functioning and relative insulation from extra departmental campus colleagues in a unique and peculiarly potent pattern that is more than the sum of any of its parts. Moreover, the potency of that pattern appears to persist relatively independent of the institutional setting and the individual role orientation of faculty members.

On the face of it, these findings would appear to have some rather important implications for both research and practice. From the research perspective, they suggest that the impact of colleagueship on faculty productivity has been largely underestimated insofar as investigators have focused on one specific area of collegial need fulfillment--interaction with off-campus, disciplinary colleagues. From a more practical perspective, the findings have implications for those faculty development efforts focusing on disciplinary and research activity. Most obviously, the suggest that programs supporting faculty travel to professional meetings and faculty off-campus leaves need to be supplemented by programs to strengthen

faculty departmental relationships--to provide, as it were, an institutional, internal structure to nuture and support the fruits of extramural activity.

The elaboration of any such implications must, however, await further efforts to overcome some of the limitations of this initial study--and these are several fold. First is the matter of the generalizability of the findings in view of the very low response rate for the liberal arts college faculty subsample. While this response rate issue does not detract directly from the generalizability of findings for the university faculty subsample, another matter does--the vulnerability of the pure types we have derived to sampling fluctuation. Indeed, Overall and Klett (1972) demonstrate some instability in the pure types derived from linear typal analysis with sampling fluctuations. While the pure types we have uncovered make some intuitive sense, the question remains as to how similar a pattern structure would emerge with larger, more varied samples--i.e. to what extent our pure types pass a replication test.

Beyond the issues of generalizability and replicability, there are limitations that go to the very heart of the meaning of the present findings. These findings are limited by the survey nature of the study design: a snapshot at one point in time. We are in no position to make inferences on how changing patterns of colleagueship affect research productivity. While there is no direct evidence of either short or long term stability in colleagueship patterns, the lack of significant differences in such patterns probably do not vary systematically over the course of an academic career.

The lack of a temporal dimension to the study further squarely raises the infamous causality issue: To what extent do colleagueship patterns

cause productivity? Or to what extent does productivity create patterns of collegial interaction? No one causal direction appears any more likely than the other, although we have, in effect, in this study assumed that colleagueship patterns function as the independent variable. Exploration of the temporal dimension, however, becomes critical in terms of the implications of findings such as these for developing more productive faculty. Can, for example, the encouragement of department anchored cosmopolitanism, in the absence of an initial predisposition and capability for pursuing publishable research, create a productive faculty? Probably not--in view of the evidence that early research productivity is the best predictor of later productivity; and, at this point, we have no basis for assuming that current colleagueship patterns are nearly fully in place with one's very first publication. But, can fostering department anchored cosmopolitanism make predisposed and initially productive people even more productive? "Ay that is the rub." A rub sufficiently important, we believe, to justify further exploration of the dynamics of faculty colleagueship.

APPENDIX I

List of Thirty Colleagueship Functions

1. Critical feedback on professional writing.
2. Co-author for professional publications.
3. Help in identifying sources of research support.
4. Help in generating and/or testing ideas for research.
5. Nomination for professional association panels/committees/offices.
6. Providing references to the literature and/or links to other scholars directly related to your research.
7. Providing access to publication media for professional writing.
8. Nomination for consulting and/or speaking assignments.
9. Providing ideas for reading and written assignments in your courses.
10. Consultation on specific problems encountered in research.
11. Consultation on specific problems encountered in the classroom.
12. Help/advice/models in developing new courses.
13. Advice on the use of teaching techniques.
14. Co-teacher for a course/workshop.
15. Nomination for campus or college/department committee assignments.
16. General intellectual stimulation.
17. Providing information on new developments or perspectives in your field.
18. Providing information on current (imminent) job opportunities.
19. Companionship in social and/or recreational activities.
20. "Troubleshooting" on one's behalf with administrators or colleagues.
21. Informant on department or institutional "politics".
22. Informant on professional association "politics".
23. A listening ear for personal problems.
24. Advice and support in negotiating career hurdles .

Appendix I (continued)

25. Providing information on institutional policies and procedures.

26. Nomination/sponsorship for academic positions.

27. Introduction to eminent scholars in your field.

28. General support and encouragement.

29. Discussion of curriculum or educational policy issues.

30. Collaboration in the conduct of research.

REFERENCES

Alderfer, Clayton. Existence, Relatedness and Growth: Human Needs in Organizational Settings. New York: Free Press, 1972.

Baldwin, Roger. "Adult and Career Development: What are the Implications for Faculty?" Current Issues in Higher Education. No. 2. Washington, D.C.: American Association for Higher Education, 1979.

Bayer, Allan and Jeffrey Dutton. "Career Age and Research-Professional Activities of Academic Scientists." Journal of Higher Education 48 (May/June 1977): 259-82.

Bess, James. "The Motivation to Teach." Journal of Higher Education 48 (May/June 1977): 243-58.

Biglan, Anthony. "The Characteristics of Subject Matter in Different Academic Areas." Journal of Applied Psychology 57 (June 1973): 195-203.

Blackburn, Robert, C.E. Behymer, and D.E. Hall. "Correlates of Faculty Publication." Sociology of Education 51 (April 1978): 132-41.

Blau, Peter. The Organization of Academic Work. New York: Wiley, 1973.

Cameron, Susan and Robert Blackburn. "Sponsorship and Academic Career Success." Journal of Higher Education 52 (July/August 1981): 369-77.

Crane, Diana. "Scientists at Major and Minor Universities: A Study of Productivity and Recognition." American Sociological Review 30 (October 1965): 699-714.

Crane, Diana. Invisible Colleges. Chicago: University of Chicago Press, 1972.

Finkelstein, Martin. "Three Decades of Research on American Academics: A Descriptive Portrait and Synthesis of Findings." Unpublished Ph.D. dissertation, State University of New York at Buffalo, 1978.

Finkelstein, Martin. "Understanding American Academics." Occasional Papers in Higher Education. Buffalo: State University of New York at Buffalo, Department of Higher Education, 1980.

Freedman, Mervin et al. Academic Culture and Faculty Development. Berkeley: Montaigne Press, 1979.

Fulton, Oliver and Martin Trow. "Research Activity in American Higher Education." Sociology of Education 47 (Winter 1974): 29-73.

Glueck, William and Lawrence Jauch. "Sources of Research Ideas Among Productive Scholars." Journal of Higher Education 46 (January/February 1975): 103-14.

Gollob, Harry. "Confounding of Sources of Variation in Factor Analytic Techniques." Psychological Bulletin 70 (1968): 330-44.

Gouldner, Alvin. "Cosmopolitans and Locals: Toward an Analysis of Latent Social Roles." Administrative Science Quarterly 2 (December 1957): 281-306.

Granovetter, Mark. "The Strength of Weak Ties." American Journal of Sociology 78 (1973): 1360-80.

Kuhn, Thomas. The Structure of Scientific Revolutions. Second Edition. Chicago: University of Chicago Press, 1970.

Lazarsfeld, Paul and Wagner Thielens. The Academic Mind. Glencoe, Illinois: Free Press, 1958.

Lodahl, Janice and Gerald Gordon. "The Structure of Scientific Fields and the Functioning of University Graduate Departments." American Sociological Review 37 (February 1972): 57-72.

Long, John. "Productivity and Academic Position in the Scientific Career." American Sociological Reveiw 43 (December 1978): 899-908.

Manis, J.G. "Some Academic Influences on Publication Productivity." Social Forces 29 (March 1950): 267-72.

Maslow, Abraham. Motivation and Personality. Second Edition. New York: Harper and Row, 1970.

Milgram, Stanley. "The Small World Problem." Psychology Today 1 (May 1967): 62-67.

Overall, John and C. James Klett. Applied Multivariate Analysis. New York: McGraw-Hill, 1972.

Reskin, Barbara. "Scientific Productivity and the Reward Structure of Science." American Sociological Review 42 (June 1977): 491-504.

Reskin, Barbara. "Academic Sponorship and Scientists' Careers." Sociology of Education 52 (July 1979): 129-46.

Smart, John and Charles Elton. "Goal Orientations of Academic Departments: A Test of Biglan's Model." Journal of Applied Psychology 60 (1975): 580-88.

Thorp, "The Administration of Research in Universities: An Investigation into the Influence of Department Chairman and Research Directors on the Satisfaction and Productivity of Research Professors." Unpublished Ph.D. dissertation, University of Missouri-Columbia, 1970.

Table 1

Prototypical (Mean) Profiles for Pure

Type Colleagueship Patterns

Variable	Type 1	Type 2	Type 3	Type 4	All Sample Mean	All Sample Median
Off	0.65	3.35	3.73	3.73	2.73	3.24
Camp	3.22	0.50	2.00	2.50	2.59	2.67
Dept-TR	3.54	3.59	1.97	0.83	3.21	3.33
Dept-Support	3.38	3.67	0.79	2.88	2.90	3.08
COLLEVEL	2.70	2.78	2.12	2.49	2.96	2.96

Table 2

The Association of Institutional Type and Colleagueship Patterns (Colltype)

COLLTYPE \ INTYPE	UNIV.	4-yr COLLEGE	ROW TOTAL
1.	11 27.5 13.8 8.1	29 72.5 51.8 21.3	40 29.4
2.	37 92.5 46.3 27.2	3 7.5 5.4 2.2	40 29.4
3.	23 67.6 28.8 16.9	11 32.4 19.6 8.1	34 25.0
4.	9 40.9 11.3 6.6	13 59.1 23.2 9.6	22 16.2
COLUMN TOTAL	80 58.8	56 41.2	136 100.0

CHI SQUARE = 38.93994

SIGNIFICANCE = 0.0000

LAMBDA (ASYMMETRIC) = 0.27083 WITH COLLTYPE DEPENDENT.

Table 3

The Association of Teaching-Research Orientation and Colleagueship Patterns (Colltype)

COLLTYPE \ TRORIENT	~~HEAVILY~~ IN RESEA ORIENTED.	TEACH ORIENTED	ROW TOTAL
1.	4 10.0 10.5 3.0	36 90.0 37.9 27.1	40 30.1
2.	13 32.5 34.2 9.8	27 67.5 28.4 20.3	40 30.1
3.	13 40.6 34.2 9.8	19 59.4 20.0 14.3	32 24.1
4.	8 38.1 21.1 6.0	13 61.9 13.7 9.8	21 15.8
COLUMN TOTAL	38 28.6	95 71.4	133 100.0

CHI SQUARE = 10.27396

SIGNIFICANCE = 0.0164

LAMBDA (ASYMMETRIC) = 0.09677 WITH COLLTYPE DEPENDENT.

Table 4

The Association of Institutional Type and Level of Off-Campus Collegial Functioning (Off)

OFF	INTYPE: UNIV.	INTYPE: 4-YR COLLEGE	ROW TOTAL
LO	39	37	76
	51.3	48.7	49.7
	42.9	59.7	
	25.5	24.2	
HI	52	25	77
	67.5	32.5	50.3
	57.1	40.3	
	34.0	16.3	
COLUMN TOTAL	91	62	153
	59.5	40.5	100.0

CORRECTED CHI SQUARE = 3.52765
RAW CHI SQUARE = 4.17337

SIGNIFICANCE = 0.0604
SIGNIFICANCE = 0.0411

LAMBDA (ASYMMETRIC) = 0.15789 WITH OFF DEPENDENT.

Table 5

The Association of Teaching-Research Orientation and Level of Off-Campus Collegial Functioning (Off)

OFF	TRORIENT: ~~HEAVILY~~ RESEA ORIENTED.	TRORIENT: TEACH ORIENTED	ROW TOTAL
LO	16	59	75
	21.3	78.7	50.0
	34.8	56.7	
	10.7	39.3	
HI	30	45	75
	40.0	60.0	50.0
	65.2	43.3	
	20.0	30.0	
COLUMN TOTAL	46	104	150
	30.7	69.3	100.0

CORRECTED CHI SQUARE = 5.29391
RAW CHI SQUARE = 6.14548

SIGNIFICANCE = 0.0213
SIGNIFICANCE = 0.0132

LAMBDA (ASYMMETRIC) = 0.18667 WITH OFF DEPENDENT.

Table 6

The Association of Institutional Type and Level of Campus Colleague Functioning (CAMP)

CAMP	INTYPE: UNIV.	INTYPE: 4-YR COLLEGE.	ROW TOTAL
LO	54	16	70
	77.1	22.9	52.2
	77.1	25.0	
	40.3	11.9	
HI	16	48	64
	25.0	75.0	47.8
	22.9	75.0	
	11.9	35.8	
COLUMN TOTAL	70	64	134
	52.2	47.8	100.0

CORRECTED CHI SQUARE = 34.37303
RAW CHI SQUARE = 36.43296

SIGNIFICANCE = 0.0000
SIGNIFICANCE = 0.0000

LAMBDA (ASYMMETRIC) = 0.50000
WITH CAMP DEPENDENT

Table 7

The Association of Teaching-Research Orientation and Level of Campus Colleague Functioning (CAMP)

CAMP	TRORIENT: HEAVILY IN RESEA ORIENTED.	TRORIENT: TEACH ORIENTED.	ROW TOTAL
LO	25	45	70
	35.7	64.3	52.6
	65.8	47.4	
	18.8	33.8	
HI	13	50	63
	20.6	79.4	47.4
	34.2	52.6	
	9.8	37.6	
COLUMN TOTAL	38	95	133
	28.6	71.4	100.0

CORRECTED CHI SQUARE = 2.99250
RAW CHI SQUARE = 3.69444

SIGNIFICANCE = 0.0837
SIGNIFICANCE = 0.0546

LAMBDA (ASYMMETRIC) = 0.07937
WITH CAMP DEPENDENT

Table 8

The Effect of Colleagueship Patterns (Colltype) on Publication Rate, Controlling for Macro and Individual Variables

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	2.728	3	0.909	4.459	0.005
COLLTYPE	2.728	3	0.909	4.459	0.005
COVARIATES	3.654	4	0.913	4.479	0.002
INTYPE	0.023	1	0.023	0.113	0.737
D1 (Social science)	0.137	1	0.137	0.673	0.414
YREXP	0.001	1	0.001	0.003	0.954
TRORIENT	3.050	1	3.050	14.955	0.000
EXPLAINED	6.382	7	0.912	4.471	0.000
RESIDUAL	22.432	110	0.204		
TOTAL	28.814	117	0.246		

Table 9

Multipe Classification Analysis: Colltype on Publication Rate, Controlling for Covariates

GRAND MEAN = 1.58

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
COLLTYPE							
1	36	-0.22		-0.22		-0.15	
2	32	0.17		0.17		0.16	
3	29	0.04		0.04		0.01	
4	21	0.04		0.04		-0.01	
			0.31		0.31		0.24
MULTIPLE R SQUARED					0.095		0.221
MULTIPLE R					0.308		0.471

Table 10

The Effect of Overall Level of Need Fulfillment (Collevel) on Publication Rate, Controlling for Covariates

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	0.180	1	0.180	0.874	0.352
COLLEVEL	0.180	1	0.180	0.874	0.352
COVARIATES	5.354	4	1.339	6.490	0.000
INTYPE	0.226	1	0.226	1.094	0.298
D1 (Social Sciences)	0.868	1	0.868	4.209	0.043
YREXP	0.126	1	0.126	0.611	0.436
TRORIENT	2.598	1	2.598	12.594	0.001
EXPLAINED	5.535	5	1.107	5.367	0.000
RESIDUAL	19.594	95	0.206		
TOTAL	25.129	100	0.251		

Table 11

Multiple Classification Analysis: Collevel on Publication Rate, Controlling for Covariates

GRAND MEAN = 1.53

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
COLLEVEL							
1 (LO)	47	-0.05		-0.05		-0.03	
2 (HI)	54	0.04		0.04		0.03	
			0.08		0.08		0.06
MULTIPLE R SQUARED					0.007		0.220
MULTIPLE R					0.085		0.469

Table 12

The Effect of Level of Off-Campus Collegial Functioning (OFF) on Publication Rate, Controlling for Covariates

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	0.909	1	0.909	4.129	0.044
OFF	0.909	1	0.909	4.129	0.044
COVARIATES	3.997	4	0.999	4.539	0.002
INTYPE	0.154	1	0.154	0.701	0.404
D1 (Social Sciences)	0.452	1	0.452	2.053	0.154
YREXP	0.003	1	0.003	0.015	0.903
TRORIENT	2.596	1	2.596	11.790	0.001
EXPLAINED	4.906	5	0.981	4.457	0.001
RESIDUAL	28.623	130	0.220		
TOTAL	33.529	135	0.248		

Table 13

Multiple Classification Analysis: Off on Publication Rate, Controlling for Covariates

GRAND MEAN = 1.56

VARIABLE + CATEGORY	N	UNADJUSTED DEVTN	ETA	ADJUSTED FOR INDEPENDENTS DEVTN	BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEVTN	BETA
OFF							
1 (LO)	69	-0.08		-0.08		-0.04	
2 (HI)	67	0.08		0.08		0.04	
			0.16		0.16		0.08
MULTIPLE R SQUARED					0.027		0.146
MULTIPLE R					0.165		0.383

Table 14

The Effect of Level of Campus Colleague Functioning (CAMP) on Publicate Rate, Controlling for Covariates

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	0.820	1	0.820	3.964	0.049
CAMP	0.820	1	0.820	3.964	0.049
COVARIATES	5.396	4	1.349	6.523	0.000
INTYPE	0.001	1	0.001	0.003	0.960
D1	0.778	1	0.778	3.763	0.055
YREXP	0.019	1	0.019	0.092	0.762
TRORIENT	3.310	1	3.310	16.005	0.000
EXPLAINED	6.216	5	1.243	6.011	0.000
RESIDUAL	23.576	114	0.207		
TOTAL	29.792	119	0.250		

Table 15

Multiple Classification Analysis: Camp on Publication Rate, Controlling for Covariates

GRAND MEAN = 1.54

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
CAMP							
1 (LO)	61	0.08		0.08		0.05	
2 (HI)	59	-0.08		-0.08		-0.05	
			0.17		0.17		0.10
MULTIPLE R SQUARED					0.028		0.209
MULTIPLE R					0.166		0.457

Table 16

The Effect of Level of Department Colleague Teaching-Research Support (Dept-tr) on Publication Rate, Controlling for Covariates

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	0.518	1	0.518	2.542	0.114
DEPTR	0.518	1	0.518	2.542	0.114
COVARIATES	5.441	4	1.360	6.672	0.000
INTYPE	0.488	1	0.488	2.393	0.125
D1 (Social Sciences)	0.684	1	0.684	3.355	0.070
YREXP	0.041	1	0.041	0.199	0.657
TRORIENT	2.733	1	2.733	13.406	0.000
EXPLAINED	5.960	5	1.192	5.846	0.000
RESIDUAL	21.410	105	0.204		
TOTAL	27.369	110	0.249		

Table 17

Multiple Classification Analysis: Dept-tr on Publication Rate, Controlling for Covariates

GRAND MEAN = 1.56

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
DEPTR							
1 (Lo)	47	0.08		0.08		0.06	
2 (Hi)	64	-0.06		-0.06		-0.04	
			0.14		0.14		0.10
MULTIPLE R SQUARED					0.019		0.218
MULTIPLE R					0.138		0.467

Table 18

The Effect of Level of Department Colleague General Support (Dept-support) on Publication Rate, Controlling for Covariates

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	0.633	1	0.633	2.928	0.089
DEPT-SUPPORT	0.633	1	0.633	2.928	0.089
COVARIATES	5.034	4	1.258	5.821	0.000
INTYPE	0.345	1	0.345	1.595	0.209
D1 (Social Sciences)	0.660	1	0.660	3.055	0.083
YREXP	0.009	1	0.009	0.044	0.835
TRORIENT	2.609	1	2.609	12.071	0.001
EXPLAINED	5.666	5	1.133	5.242	0.000
RESIDUAL	29.185	135	0.216		
TOTAL	34.851	140	0.249		

Table 19

Multiple Classification Analysis: Dept-Support on Publication Rate, Controlling for Covariates

GRAND MEAN = 1.55

VARIABLE + CATEGORY	N	UNADJUSTED DEVN	ETA	ADJUSTED FOR INDEPENDENTS DEVN.	BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEVN	BETA
DEPT-SUPPORT							
1 (Lo)	71	0.07		0.07		0.05	
2 (Hi)	70	-0.07		-0.07		-0.05	
			0.13		0.13		0.10
MULTIPLE R SQUARED					0.018		0.163
MULTIPLE R					0.135		0.403

Table 20

The Association of Collegueship Patterns (Colltype) and Publication Rate for University Faculty Subsample

RPROD	COLLTYPE 1.	2.	3.	4.	ROW TOTAL
LO	3 13.0 37.5 4.4	7 30.4 23.3 10.3	7 30.4 33.3 10.3	6 26.1 66.7 8.8	23 33.8
HI	5 11.1 62.5 7.4	23 51.1 76.7 33.8	14 31.1 66.7 20.6	3 6.7 33.3 4.4	45 66.2
COLUMN TOTAL	8 11.8	30 44.1	21 30.9	9 13.2	68 100.0

CHI SQUARE = 5.55267 SIGNIFICANCE = 0.1185

CONTINGENCY COEFFICIENT = 0.28173
LAMBDA (ASYMMETRIC) = 0.13043 WITH RPROD DEPENDENT

Table 21

The Association of Collegueship Patterns (Colltype) and Publication Rate for 4-Yr College Faculty Subsample

RPROD	COLLTYPE 1.	2.	3.	4.	ROW TOTAL
LO	21 70.0 72.4 37.5	2 6.7 66.7 3.6	5 16.7 45.5 8.9	2 6.7 15.4 3.6	30 53.6
HI	8 30.8 27.6 14.3	1 3.8 33.3 1.8	6 23.1 54.5 10.7	11 42.3 84.6 19.6	26 46.4
COLUMN TOTAL	29 51.8	3 5.4	11 19.6	13 23.2	56 100.0

CHI SQUARE = 12.25943 SIGNIFICANCE = 0.0065

CONTINGENCY COEFFICIENT = 0.42379
LAMBDA (ASYMMETRIC) = 0.38462 WITH RPROD DEPENDENT